

Sensitivity analysis of climate change risk assessment

Study of parameters variation in hazard indicators

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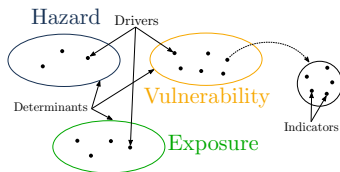
University of Turin

Midterm discussion, 4 July 2024

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Introduction

- ▶ Risk: potential for adverse consequences for human or ecological systems [...]
- ▶ Climate Change Risk Assessment (CCRA)



The problem

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- ▶ The choice of indicators is arbitrary
- ▶ Analysis of the sensitivity of indicators to a change in value of their parameters, for drivers within the hazard determinant

► Torino Airport

Case study

- ▶ Torino Airport
- ▶ Hazard drivers: heat wave, heavy precipitation

- ▶ Climatological baseline: ERA5
- ▶ Climate projections: NEX-GDDP-CMIP6

- ▶ Organisation: European Centre for Medium-Range Weather Forecasts
- ▶ Data type: reanalysis
- ▶ Spatial resolution: $0.25^\circ \times 0.25^\circ$
- ▶ Time frequency: hour

- ▶ Organisation: NASA Earth Exchange
- ▶ Data type: statistically downscaled bias-corrected climate projections
- ▶ Spatial resolution: $0.25^{\circ} \times 0.25^{\circ}$
- ▶ Time frequency: day
- ▶ Historical period 1950-2014, projection period 2015-2100
- ▶ Model: EC-Earth3
- ▶ Scenario: SSP1-2.6, SSP2-4.5, SSP5-8.5

- ▶ Box of 3×3 grid points centred at the coordinates of the airport

Temporal domain

- ▶ Baseline period: 1994-2023
- ▶ Time horizons: 2021-2040, 2051-2070, 2081-2100

- ▶ Indicators: heat wave frequency, maximum n -days precipitation
- ▶ Fixed exposure and vulnerability from literature

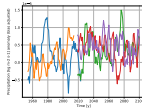
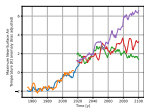
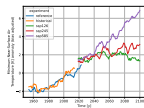
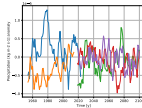
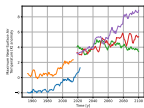
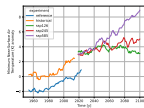
- ▶ Indicators: heat wave frequency, maximum n -days precipitation
- ▶ Fixed exposure and vulnerability from literature
- ▶ Evaluate risk following the guidelines

Preprocessing

1. Regrid ERA5
2. Aggregate ERA5 at daily frequency
3. Align NEX-GDDP-CMIP6 timestamps

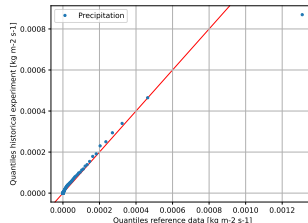
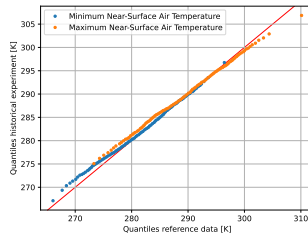
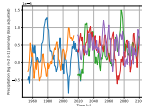
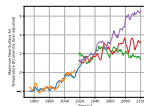
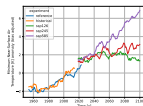
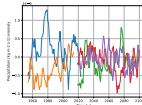
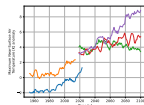
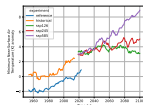
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4. Bias adjustment



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Evaluation of hazard indicators

1. Define intervals of parameters

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2. Spatial aggregation

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2. Spatial aggregation
3. Temporal aggregation

Evaluation of hazard indicators

1. Define intervals of parameters
2. Spatial aggregation
3. Temporal aggregation
4. Risk evaluation

Heat wave frequency

Next steps

- ▶ Uncertainty evaluation
- ▶ Evaluate risk with non-linear relations among hazard indicators and among determinants
- ▶ Extend analysis to Bologna's and Ciampino's airports
- ▶ Choose points of the interval more appropriate for the location of interest